UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/677,200 | 10/01/2003 | Katsuhiko Kemmochi | 4666-019 | 9623 |

20575 7590 07/07/2006

MARGER JOHNSON & MCCOLLOM, P.C.
210 SW MORRISON STREET, SUITE 400
PORTLAND, OR 97204

| EXAMINER | |
|---|---|
| DEHGHAN, QUEENIE S | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1731 | |

DATE MAILED: 07/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/677,200 | KEMMOCHI ET AL. | |
| | Examiner | Art Unit | |
| | Queenie Dehghan | 1731 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *24 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-8,17-19,28-30,44-48,50-55,58-63 and 70-85* is/are pending in the application.

4a) Of the above claim(s) *1-8,17-19 and 28-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *44-48,50-55,58-63 and 70-85* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 44, 48, 50-52, 58, and 59, are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (5,885,071) in view of Nunome et al. (JP 2000-247778). Watanabe et al. disclose a method for making a silica crucible comprising: feeding quartz grains into a rotating crucible mold (Figure 1) to form the a bottom wall and side wall of the mold, heating the interior of the mold, and feeding a inner silica grain containing aluminum or in combination with an aluminum-containing component, wherein the heat fuses the silica grain and melts the inner aluminum-containing silica

grains onto the silica grains to form a homogenous aluminum-doped inner layer (col. 2 lines 3-18, 50-52) that is 0.4mm thick (col. 4 lines 48-49, col. 6 line 14).

4. Regarding claims 44, 48, 50 and 51, Watanabe et al. mention the used of quartz grains to form another innermost layer (col. 2 lines 18-22), but does not mention an outer layer. Nunome et al. teach a method for making a silica glass crucible comprising of introducing aluminum containing quartz grains into a rotating mold to form an outer layer (abstract) that is substantially on the sidewall (layer 2 in the drawing). Nunome et al. further recite an example where aluminum doped silica grains are used to form a crucible (page 11, (2) in comp. Ex.1), where the layer had a concentration of 110ppm (Table 1 col. 3-4mm). In order to achieve a concentration of 110ppm in the layer, one would have to use grains of silica with an aluminum concentration of 110ppm. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the 0.4mm thick aluminum doped outer wall with a concentration of 110ppm, as taught by Nunome et al. in the crucible of Watanabe et al. in order to make a more durable crucible.

5. Regarding claims 52, and 58-59, Watanabe et al. fail to mention the aluminum concentration in the layers. Nunome et al. mention an outer layer made of silica grains doped with aluminum having a concentration of 50-120ppm (page 6, claim 7). Nunome et al. further recite an example where aluminum doped silica grains are used to form a crucible (page 11, (2) in comp. Ex.1), where the layer had a concentration of 110ppm (Table 1 col. 3-4mm). In order to achieve a concentration of 110ppm in the layer, one would have to use grains of silica with an aluminum concentration of 110ppm. It would

have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the silica grains doped with an aluminum concentration of 110ppm of Nunome in the various layers of Watanabe crucible, in order to enhance durability of the crucible and to improve viscosity, as taught by Nunome.

6. Claims 60, 70-73, and 78-85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (5,885,071) in view of Sato et al. (5,977,000) and Sato et al. (EP 0 691 423).

7. Watanabe discloses a method for making a silica crucible comprising: feeding quartz grains into a rotating crucible mold (Figure 1) to form the a bottom wall and side wall of the mold, heating the interior of the mold, and feeding a non-homogenous combination of quartz grains containing aluminum or quartz powder independently or quartz grains doped with aluminum (col. 2 lines 13-14, 54-60), wherein the heat fuses the silica grain and melts the inner aluminum-containing silica grains onto the silica grains (col. 2 lines 3-18) to form a non-homogenous aluminum-doped inner layer that is 0.4mm thick (col. 4 lines 48-49, col. 6 line 14).

8. Regarding claims 60 and 70, Watanabe discloses the use of combinations of silica grains containing aluminum (col. 2 lines 58-60), but does not mention a grain size. Sato et al. ('000) teach the use of various silica grain sizes in the range of 10μm to 350μm, such as a raw material with 30% of the grains that are greater than 200μm or the quartz grain A that has 40% greater than 200μm, in order to achieve high bubble densities and small bubble volumes. Sato et al. ('000) also teach the ease of achieving whatever size particles are needed by simply removing the lesser desired sized

particles by sieving (col. 7 lines 25-31). In the absence of unobvious results, it would have been obvious to one to adjust the amount of silica grains that are greater than 200μm in size in a feed composition to a desired quantity (i.e. 50%) by use of a sieve. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the amount of 200μm sized grains to be used in the layers of Watanabe crucible, in order to control the volumes of and density of bubble formations, as taught by Sato et al.

9. Regarding claims 73, 78-81, and 84-85, Watanabe et al. further disclose the use of a high purity silica grain for the inner layer (col. 3 lines 24-25) such that the metal impurities are less than 5ppm and the aluminum is less than 1ppm (table 1 inner layer composition). However, Watanabe et al. fail to disclose an inner layer doped with less than 100ppm aluminum. Sato et al. ('423) teach a fused silica glass crucible with an inner layer doped with 80ppm aluminum (page 7 example 2, page 8 table 1 column B). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the aluminum concentration of the inner layer of Sato et al. ('423) in the crucible of Watanabe et al. in order to inhibit oxidation induced stacking fault in the silicon single crystals made, as taught by Sato et al. ('423).

10. Claims 45-47, 53-55, 61-63, and 74-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (5,885,071), in view of Nunome et al. (JP 2000-247778), Sato et al. (5,977,000) and Sato et al. (EP 0 691 423), as applied to claims 44, 52, 60 and 73 above, and further in view of Hnat et al. (5,935,885). Watanabe discloses the heating of aluminum-doped silica layers in a method for

manufacturing a crucible, but does not mention the cooling steps of the silica layers. Nunome mentions the heating up of the silica grains to a temperature of 1430°C, the melting temperature of silicon (0052), but also does not mention the cooling of the silica layer. Hnat et al. teach a cooling method for molten glass (col.2 line 30-31) so as to form a plurality of nuclei of crystalline silica in the nucleation and crystallization steps (col. 7 lines 1-3) comprising of cooling down the glass from its melting temperature (of 1430°C as mentioned by Nunome), wherein the cooling comprises maintaining the silica at 1430°C for approximately 1 minute, to a temperature between 400° to 600°C, the temperature where nucleation occurs, and holding it at the nucleation temperature for 30 minutes (or approximately 25 minutes) (col. 7 lines 6-19). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize this cooling method of Hnat in the silica crucible of Watanabe, Nunome, Sato and Sato in order to achieve proper crystallization of the silica grains and forming strong layers within the silica crucible.

### ***Double Patenting***

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422

F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 44, 48, 50-52, 60, and 73 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 13-18, 20, 23-24, and 34-37 of U.S. Patent No. 6,641,663, in view of Watanabe et al (5,885,071), Sato et al. (5,977,000), and Sato et al. (EP 0 691 423).

3. Claims 1, 13-18, 20, 23-24 and 34-37 of Pat.663 recites method steps for making a silica glass crucible comprising the following steps:

a. depositing a silica bulk grain layer on the interior wall of a rotating crucible mold, forming a side wall and bottom wall (claims 1 and 17-18),

b. heating the interior of the mold (claims 1 and 17),

c. further depositing an inner silica layer doped with aluminum, wherein the heat partially melts the doped silica grain to the fused bulk layer (claims 17, 20, 23 and 24),

d. forming a silica outer layer substantially on the sidewall that is doped with aluminum in the range of 100-500ppm (claims 13-16 and 34-37).

4. Furthermore, Watanabe et al. recite an inner layer that is 0.4mm thick (col. 4 lines 48-49, col. 6 line 14). Watanabe also disclose the option of feeding a non-homogenous combination of quartz grains containing aluminum or quartz powder

independently or quartz grains doped with aluminum (col. 2 lines 13-14, 54-60), It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize aluminum inner and outer silica layers of Kemmochi (Pat. 663) with the thickness and the variation of grains of Watanabe et al. in the applicant's method for manufacturing a silica glass crucible in order to make a more durable crucible that has an extended life.

5. In addition, Sato et al. ('423) teach a fused silica glass crucible with an inner layer doped with 80ppm aluminum (page 7 example 2, page 8 table 1 column B). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the in the aluminum inner and outer silica layers of Kemmochi (Pat. 663) with the aluminum concentration of the inner layer of Sato et al. ('423) in order to inhibit oxidation induced stacking fault in the silicon single crystals made, as taught by Sato et al. ('423).

11. Also, Sato et al. ('000) teach the use of various silica grain sizes in the range of 10μm to 350μm, such as a raw material with 30% of the grains that are greater than 200μm or the quartz grain A that has 40% greater than 200μm, in order to achieve high bubble densities and small bubble volumes. Sato et al. ('000) also teach the ease of achieving whatever size particles are needed by simply removing the lesser desired sized particles by sieving (col. 7 lines 25-31). In the absence of unobvious results, it would have been obvious to one to adjust the amount of silica grains that are greater than 200μm in size in a feed composition to a desired quantity (i.e. 50%) by use of a sieve. Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to optimize the amount of 200μm sized grains to be used in the layers of Kemmochi (Pat. 663) crucible, in order to control the volumes of and density of bubble formations, as taught by Sato et al.

### *Response to Arguments*

6. Applicant's arguments with respect to the prior art of Nunome et al. have been fully considered but they are not persuasive. Nunome et al. teach a crucible that addresses a different problem, the prevention Al contamination during the pulling of silicon crystals, not the prevention of spreading rosettes. Furthermore, Nunome et al. teach of an aluminum doped outer layer to provide for a durable crucible (0086), similar to the disclosed intention of the outer layer of the applicant, to prevent sagging of the crucible in page 5.

7. Applicant's arguments with respect to the prior art of Sato et al. ('000) have been fully considered but they are not persuasive. Sato et al. teach the general concept of controlling grain size in the making of a crucible by selectively sieving. Using doped grains would just be a variation of the same concept of controlling grain size.

8. Applicant's cancellation of claims 49, 56-57, and 64-69 has been acknowledged.

### *Conclusion*

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Queenie Dehghan whose telephone number is (571)272-8209. The examiner can normally be reached on Monday through Friday 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

STEVEN P. GRIFFIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

Q Dehghan